

CLAIMS

1. A well plate comprising:
at least one well, each well having a reservoir and a capillary lumen in fluid communication with said reservoir such that when a liquid is contained in said well, said liquid migrates at least part way up said capillary lumen due to capillary forces.
2. The well plate of claim 1 wherein said capillary lumen is cylindrical shaped.
3. The well plate of claim 1 wherein said capillary lumen is non-cylindrical shaped.
4. The well plate of claim 1 wherein said capillary lumen is upright.
5. The well plate of claim 1 wherein the capillary lumen is held at an angle.
6. The well plate of claim 5 wherein said angle is from 5 to 50 degrees.
7. The well plate of claim 1 wherein a lower end of said capillary lumen is positioned a distance above a bottom of said reservoir.
8. The well plate of claim 1 wherein said capillary lumen has an enlarged lower end section.
9. The well plate of claim 8 wherein said enlarged lower end section varies in diameter and has a maximum diameter at a lower tip.
10. The well plate of claim 9 wherein said enlarged lower end section is linear shaped.

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11. The well plate of claim 10 wherein said lower end section expands at an angle between 1 to 70 degrees to an axis extending through said capillary lumen.

12. The well plate of claim 9 wherein the enlarged lower end section is non-linear shaped.

13. The well plate of claim 1 wherein the capillary lumen has a height less than a height of said well such that when a cover is attached atop said well plate, a gap is formed between the capillary lumen and the cover.

14. The well plate of claim 13 wherein said gap ranges from 1 to 10 mm.

15. The well plate of claim 1 wherein the capillary lumen has a height equal to a height or greater than the height of the at least one well.

16. The well plate of claim 1 wherein said capillary lumen has an inner diameter ranging from 0.1 to 4.0 mm.

17. The well plate of claim 16 wherein said capillary lumen has an inner diameter ranging from 0.5 to 3.0 mm.

18. The well plate of claim 1 wherein said capillary lumen comprises a hydrophilic coating.

19. The well plate of claim 1 wherein said capillary lumen comprises a hydrophobic coating.

20. The well plate of claim 1 wherein said well has an effective diameter ranging from 0.2 to 20 mm.

21. The well plate of claim 20 wherein said effective diameter ranges from 2 to 10 mm.

22. The well plate of claim 1 wherein the well plate comprises at least a base and a top half containing said at least one capillary lumen.

23. The well plate of claim 22 wherein said top half is an injection molded part and said base is a thin film joined to said top half to form each of said wells.

24. The well plate of claim 1 wherein said capillary lumen is press fit into position.

25. The well plate of claim 1 wherein said capillary lumen is integrally formed in a corner of each well.

26. An insert for use with a well plate having at least one well, said insert comprising:

a capillary; and

at least one support attached to said capillary such that when said capillary is positioned in said at least one well said at least one support contacts said well plate and secures said capillary in said at least one well such that when a source fluid is contained within said at least one well, said capillary is in fluid communication with said source fluid.

27. The insert of claim 26 wherein said capillary is cylindrical.

28. The insert of claim 26 wherein said capillary is non-cylindrical.

29. The insert of claim 26 wherein said capillary is held upright.

30. The insert of claim 26 wherein the capillary is held at an angle.
31. The insert of claim 30 wherein said angle is from 5 to 50 degrees.
32. The insert of claim 26 wherein a lower end of said capillary is positioned a distance above a bottom of said reservoir.
33. The insert of claim 26 wherein said capillary has an enlarged lower end section.
34. The insert of claim 33 wherein said enlarged lower end section varies in diameter and has a maximum diameter at a lower tip.
35. The insert of claim 34 wherein said enlarged lower end section is linear shaped.
36. The insert of claim 35 wherein said lower end section expands at an angle between 1 to 70 degrees to an axis extending through said capillary.
37. The insert of claim 34 wherein the enlarged lower end section is non-linear shaped.
38. The insert of claim 26 wherein the capillary has a height less than a height of said well such that when a cover is attached atop said well plate, a gap is formed between the capillary and the cover.
39. The insert of claim 38 wherein said gap ranges from 1 to 10 mm.
40. The insert of claim 26 wherein the capillary lumen has a height equal to a height or greater than the height of the at least one well.

41. The insert of claim 26 wherein said capillary has an inner diameter ranging from 0.1 to 4.0 mm.
42. The insert of claim 41 wherein said capillary has an inner diameter ranging from 0.5 to 3.0 mm.
43. The insert of claim 26 wherein said capillary comprises a hydrophilic coating.
44. The insert of claim 26 wherein said capillary comprises a hydrophobic coating.
45. The insert of claim 26 wherein said well has an effective diameter ranging from 0.2 to 20 mm.
46. The insert of claim 45 wherein said effective diameter ranges from 2 to 10 mm.
47. The insert of claim 26 wherein said at least one support is sized to fit within a well of a conventional well plate.
48. The insert of claim 26 wherein said at least one insert is sized to fit in a square-shaped well having a side length from 0.01 to 5 cm.
49. The insert of claim 26 wherein the insert is injection molded.
50. The insert of claim 26 comprising 2-5 supports.
51. The insert of claim 26 comprising 2-3 supports.
52. The insert of claim 26 wherein said at least one support is planar.

53. The insert of claim 26 wherein said at least one support is curved.

54. The insert of claim 26 further comprising at least one spacer, said at least one spacer disposed at a base of said capillary such that when said capillary is positioned in said well, said capillary is spaced apart from a bottom of said at least one well.

55. The insert of any one of claims 26-54 wherein said capillary has a base and a liquid restricting inlet in said base, said liquid restricting inlet having an inner diameter such that when said capillary is positioned in said at least one well and when a source fluid is contained within said at least one well said source fluid forms a free surface at said liquid restricting inlet and wherein said fluid does not migrate up said capillary.

56. The insert of any one of claims 26-54 wherein said capillary has an inlet in a lower end of said capillary, said inlet having an inner diameter such that when said capillary is positioned in said at least one well and when a source fluid is contained within said at least one well said source fluid to contact said inlet migrates at least part way up said capillary due to capillary forces.

57. An insert for use with a well plate having a plurality of wells, said insert comprising:

a substrate comprising a plurality of ejection apertures; and
a capillary tube extending from each of said ejection apertures such that when said insert is positioned atop said well plate each capillary tube makes fluid communication with a liquid contained in said wells and said liquid moves at least part way up each capillary tube.

58. An insert for use with a well plate having a plurality of wells, said insert comprising:

a substrate comprising a plurality of liquid ejection apertures; and
a capillary tube extending from each capillary aperture such that when said insert is positioned atop said well plate each capillary tube makes fluid communication with a liquid contained in said well and wherein said liquid forms a free surface at a fluid restricting inlet of said capillary tube.

59. The insert of one of claims 57 and 58 wherein said substrate further comprises a plurality of filling apertures.

60. The insert of one of claims 57 and 58 wherein said at least one capillary tube is detachably coupled to said substrate.

61. The insert of one of claims 57 and 58 further comprising a lip surrounding said substrate such that said lip holds said substrate fixed atop the well plate.

62. The insert of one of claims 57 and 58 wherein said substrate is sized to fit atop a conventional well plate and position a free end of said capillary tube into a corresponding well.

63. An insert for use with a well plate having a plurality of wells, said insert comprising:

a frame; and

at least one capillary tube coupled to said frame such that when said insert is placed on top of said well plate said at least one capillary tube extends into a well of said well plate and wherein when a liquid is contained in said well, said capillary tube is in fluid communication with said liquid such that said liquid moves up said capillary tube.

64. An insert for use with a well plate having a plurality of wells, said insert comprising:

a frame sized to fit on top of said well plate; and
at least one capillary tube coupled to said frame such that when said insert is placed on top of said well plate said at least one capillary tube extends into said well and wherein when a liquid is contained in said well, said capillary tube is in fluid communication with said liquid such that said liquid will form a free surface at a fluid restricting inlet of said capillary tube.

65. The insert of one of claims 63 and 64 wherein said frame comprises a plurality of struts.

66. The insert of one of claims 63 and 64 wherein said at least one capillary tube is detachably coupled to said struts.

67. The insert of one of claims 63 and 64 further comprising a lip around said frame for securing said insert atop the well plate.

68. The insert of one of claims 63 and 64 wherein said frame is sized to fit atop a conventional well plate and position a free end of said capillary tube into a corresponding well.

69. A method for stabilizing liquid in a well of a well plate, said method comprising:

inserting a capillary tube into said well such that said capillary tube makes fluid communication with liquid in said well and wherein said liquid moves at least part way up said capillary tube due to capillary forces to form a free surface within said capillary tube.

70. A method for controlling a level of source liquid in a well of well plate, said method comprising:

inserting a capillary tube into said well such that said capillary tube makes fluid communication with liquid in said well and wherein said liquid moves at

least part way up said capillary tube due to capillary forces to form a free surface within said capillary tube and wherein said level reached in said capillary lumen remains constant regardless of the volume of liquid in said well.

71. A method for controlling the X-Y position of a maxima/minima point of a liquid meniscus, said method comprising:

providing a well plate having at least one well, each well having a base region and a shelf region wherein said shelf region has a diameter larger than said base region and wherein when said liquid is introduced into said well said X-Y position of said point remains constant as said liquid is depleted from said well.

72. The method of claim 71 wherein said shelf region includes a hydrophilic coating.

73. The method of claim 71 wherein said shelf region includes a hydrophobic coating.

74. The method of claim 71 wherein said liquid is depleted from said well using acoustic droplet ejection.

75. The method of claim 71 wherein said base region has an inner diameter ranging from 0.1 to 10.0 mm.

76. The method of claim 71 wherein the base region has an inner diameter from 0.5 to 5.0 mm.

77. The method of claim 71 wherein the base region has an inner diameter from 1.0 to 3.0 mm.

78. The method of claim 71 comprising introducing said liquid into said base region to form a liquid level within said base region.

79. The method of claim 78 wherein said liquid level within said base region is greater or equal to a top of the base region by no more than half the effective diameter of said base region.

80. The method of claim 78 wherein said liquid level within said base region is less than or equal to a top of the base region by no more than half the effective diameter of said base region.